On the relation of the AURORAS TO GRAVITATING CURRENTS.

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Prof. Loomis's observations of the number of Auroras in each month of 1869 and 1870 (Amer. Jour. of Science, 3d S., i, 309), are specially noteworthy, both because of the careful accuracy of the observer, and because they are the first published observations which furnish satisfactory data for an approximate determination of the laws of auroral distribution.

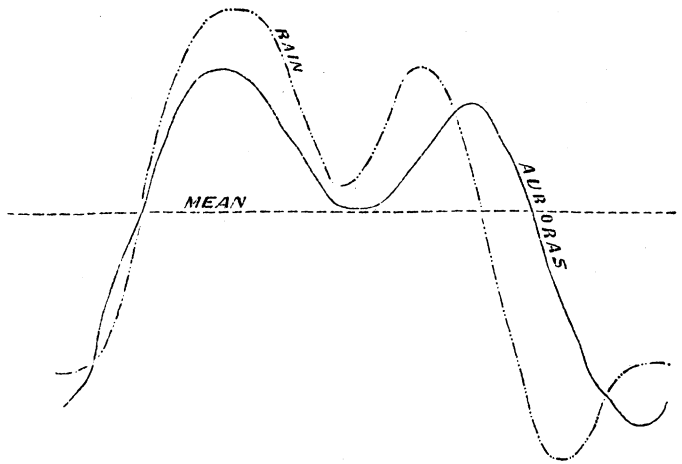
If the auroras are, as is now generally believed, luminous manifestations of terrestrial magnetism, it seems reasonable to look to them for some additional evidence upon the question of the relation between magnetic and gravitating currents. Messrs. Baxendell and Bloxam have already pointed out some resemblances between hyetal and magnetic curves, (see Proc. A. P. S., x, 368) and if analogous resemblances can be traced between hyetal and auroral curves, they will be interesting and suggestive.

I have not found the similarity between the annual distribution of rainfalls and of auroras, sufficiently striking to impress any one who has not made a special study of the causes of resemblance and difference. But, as I have repeatedly urged, currents are subject to an increased number of disguising disturbances, in proportion to the sluggishness of their motion, and the time which is consequently required for their formation or change. We may very reasonably look for analogies between the daily and the annual auroral or magnetic curves, of a character for which we could hope to find no parallel in wind, rain, or ocean-current curves.

If we desire, therefore, to find evidence of the joint influence of solar expansion and gravitating equilibrium, we should look where it is most likely to be found, and to the best of the observations which may be supposed to be fairly comparable. There are similar variations of solar attitude, and consequently increasing and diminishing solar force, in the day and in the year, but the effects of these variations upon the precipitation of vapor, are more likely to be shown in their greatest simplicity, by the means of observations at different hours of the day than at different seasons of the year. I know of no published observations of this character at New Haven, but there are some extending over a long series of years, at Philadelphia and at Greenwich, the curves at each station indicating minima of rainfall at noon and midnight, and maxima in the morning and evening. The difference of longitude between Philadelphia and New Haven being less than $2\frac{1}{2}^{\circ}$, it is not likely that there is any material difference in the daily rain-curves at the two places.

In order to make the curves fairly comparable, both in regard to the times and the magnitudes of deviation, I treated the auroral observations in the same manner as those of rainfall (Proc. A. P. S., x, 526). Both in the magnetic and in the hyetal phenomena, the greatest effects accompany the greatest atmospheric changes. But in the magnetic disturb-

ances the principal maxima occur in the spring of the year and the morning of the day, while the general evaporation is increasing, whereas, in the daily rains at Philadelphia, the principal maximum occurs in the afternoon, when evaporation is diminishing. I have, therefore, compared the midwinter ordinate of the auroral with the noon ordinate of the rain curve, and the midsummer auroral with the midnight hyetal ordinate.



The auroral observations and the normal ordinates of the accompanying curves, are given in the following table. I presume no one will doubt that the condensation of vapor, which is represented by the rain curve, is occasioned by the simple operation of gravitation in blending currents of different temperatures, and I see no reason for postulating any different law for the development of electricity and magnetism in the aurora.

Comparative Table of Auroras and Rainfalls.

Mo.	No. of Auroras.	Normals.	Hours.	Normals of Rain.	Mo.	No. of Auroras.	Normals.	Hours.	Normals of Rain.
		88	0	91			100	12	103
January	32	90	1	91	July	38	101	13	106
		94	2	93			103	14	109
February	31	98	3	98	August	34	105	15	108
		103	4	105			107	16	104
March	41	107	5	110	September	43	106	17	98
		109	6	113			103	18	92
April	44	109	7	113	October	38	100	19	87
		108	8	112			95	20	85
May	36	106	9	109	November	27	91	21	87
		103	10	105			89	22	90
June	31	101	11	102	December	30	87	23	91